Influence of Electrodeposition Conditions on the Microstructure and Hardness of Ni-B/SiC Nanocomposite Coatings

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In this study, Ni-B/SiC nanocomposite coating was prepared by electrodeposition using trimethylamine borane (TMAB) as boron source in a Ni-B electrolyte containing dispersed SiC nanoparticles. The effects of trimethylamine borane, SiC nanoparticles, current density, thermal treatment on the properties of the electrodeposited coatings were examined by SEM, EDS, XRD et al. The results show that the Ni-B/SiC composite coating exhibits nodular and uniform structure with a desirable interface between the coating and substrate. The as-deposited coatings exhibit Ni (111), Ni (220) and Ni (311) reflections. The boron content in the coating is determined by the ratio of the rate of nickel reduction and the rate of trimethylamine borane decomposition, which facilitates the formation of the amorphous phase. SiC content in the coating can substantially improve the hardness of the coatings under the as-deposited conditions, which promotes the grain refinement due to the fact that particles can act as nucleation sites during the deposition process. Both the boron and SiC nanoparticle content in the deposited Ni-B/ SiC coating decreases as the current density increased from 1 to 7 A dm⁻².

Keywords: Electrodeposition; Ni-B/SiC nanocomposite coating; wear resistance; corrosion resistance; microhardness

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